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ABSTRACT

Findings from the National Science Foundation's Survey of Scientific and Engineering Personnel Employed at Universities and Colleges, January 1982 are highlighted and discussed in this brief report. The survey was mailed to approximately 2,200 universities and colleges offering programs in the sciences and/or engineering. Areas discussed include employment status, academic versus national science/engineering (S/E) employment trends, women in academic S/E, research activities, and the leading institutions employing the largest number of scientists and engineers. Among the findings reported are those indicating: that S/E employment in the higher education sector continued to climb in 1982 to approximately 348,800; that the growth in academic employment of professionals cut across most major S/E fields, with the sharpest rise occurring in mathematical/computer sciences; that gains in S/E employment differed markedly according to type of institution; that academic employment of women scientists/engineers continued to rise at a faster pace (9 percent) than the growth rate for men (3 percent); and that the number of scientists and engineers engaged in separately budgeted research and development activities, as measured in full-time-equivalent terms, totaled approximately 60,000 in 1982, for an average annual increase of 2 percent since 1975. (JN)

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SCIENCE RESOURCES STUDIES HIGHLIGHTS

NATIONAL SCIENCE FOUNDATION WASHINGTON, D.C. 20550 JULY 29, 1983 NSF 83-317

Academic Employment of Scientists and Engineers Continued to Grow in 1982, but Slower Than in Other Economic Sectors

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This report is based upon the findings of the National Science Foundation's (NSF's) Survey of Scientific and Engineering Personnel Employed at Universities and Colleges, January 1982. The survey was mailed to approximately 2,200 universities and colleges offering programs in the sciences and/or engineering. The number of scientists and engineers employed in higher education institutions shown in this report includes an estimate for nonresponse comprising 22 percent of the total. For doctorate-granting institutions, accounting for about two-thirds of total academic scientists and engineers, nonresponse estimates represented only 11 percent of the total.

Highlights

• Science and engineering (S/E) employment in the higher education sector continued to climb in 1982 to approximately 348,800. The 4-percent rise over the 1981 level was nearly the same as the average increase reported between 1975 and 1981. The number of engineers grew slightly faster than that for all scientists, about 5 percent compared to 4 percent over 1981 levels.

• The growth in academic employment of professionals cut across most major S/E fields. The sharpest rise occurred in the mathematical/computer sciences, up 8 percent from 1981 to 1982, with more than one-half the increase attributable to the 18-percent gain in computer scientists. Virtually no growth occurred in employment of environmental scientists.

• While the number of academic S/E professionals—about 11 percent of the Nation's scientists and engineers—continued to expand the 1981/82 rate of increase was slower than the 7-percent to 8-percent rates of the Federal and industrial sectors.[1]

• Academic S/E personnel employed part time—23 percent of total scientists and engineers in universities and colleges—accounted for nearly one-half the total 1982 employment gain; part-time employment increased 9 percent, or three times the full-time rate. This represents an acceleration of the increasing trend toward use of part-timers. The most notable part-time growth was seen in the computer sciences—up a total of 28 percent in 1982—a condition corresponding to rapidly growing enrollment in response to the demands by private industry for computer scientists.

• Gains in S/E employment differed markedly according to type of institution. The number of scientists and engineers at both doctorate- and bachelor's-granting institutions increased by 4 percent in 1982, while master's-granting institutions reported a 2-percent rise. The largest rate of growth, however, occurred at 2-year institutions, up 10 percent between 1981 and 1982. This phenomenon is attributed in part to the fact that enrollment at 2-year institutions grew more rapidly between 1980 and 1981 than did enrollment in universities and 4-year institutions—4 percent compared to 1 percent.[2]

• Academic employment of women scientists and engineers continued to rise at a faster pace (9 percent) than the growth rate for men (3 percent). Women's relative share of the S/E total in higher education, however, remained at 20 percent compared to their 13-percent share of the national S/E work force.[3] In 1982, the fastest growth rates for academic S/E women occurred among life scientists, up 12 percent, and mathematical/computer scientists, up 11 percent. The numbers of their male colleagues increased most rapidly in mathematical/computer sciences, a gain of 7 percent, and in engineering and the life sciences, each up 4 percent over 1981 levels (chart 1).

• The number of scientists and engineers engaged in separately budgeted research and development (R&D) activities, as measured in full-time-equivalent (FTE) terms, totaled approximately 60,000 in 1982, for an average annual increase of 2 percent since 1975.[4] The majority of full-time equivalents employed in R&D activities were in the sciences, particularly the life sciences (59 percent), while engineering accounted for only 11 percent of the total.

[1] National Science Foundation, *National Patterns of Science and Technology Resources, 1983* (Washington, D.C.: Supt. of Documents, U.S. Government Printing Office, 1983), table 71 (in press).

[2] Department of Education, National Center for Education Statistics, Opening Fall Enrollment Survey, Fall 1981, unpublished data.

[3] National Science Foundation, *National Patterns of Science and Technology Resources, 1983*, op. cit.

[4] It should be noted that data for nonsponsored R&D activities are not collected in this survey and, therefore, are not included in this total. It has been estimated by the National Science Foundation that such activity might inflate reported full-time equivalents in research and development by as much as one-third. National Science Foundation, "University S/E Faculty Spend One-Third of Professional Time in Research," *Science Resources Studies Highlights* (NSF 81-317) (Washington, D.C., August 31, 1981), table 2.

Prepared in the Universities and Nonprofit Institutions Studies Group, Division of Science Resources Studies

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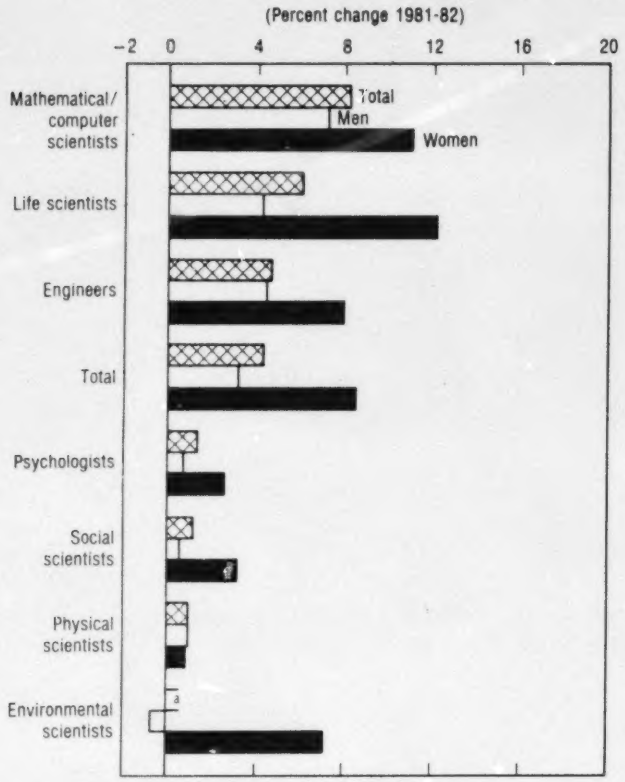
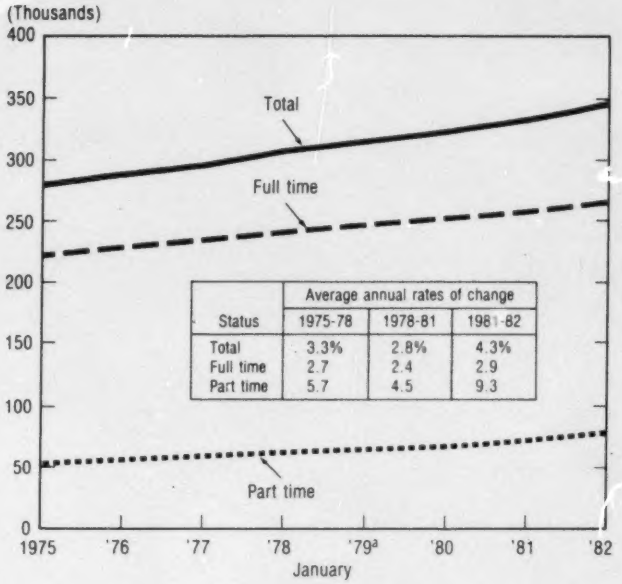
Chart 1. Scientists and engineers employed at universities and colleges by field and sex



[a]Less than 0.5 percent
SOURCE: National Science Foundation

Chart 2. Scientists and engineers employed at universities and colleges by status



Status	Average annual rates of change 1975-78	1978-81	1981-82
Total	3.3%	2.8%	4.3%
Full time	2.7	2.4	2.9
Part time	5.7	4.5	9.3

[a]Estimated based on data collected from doctorate-granting institutions only
SOURCE: National Science Foundation

Employment Status

The steady rates of increase in both full- and part-time S/E employment in higher education institutions continued into 1982. The 4-percent rise in academic S/E employment brought approximately 14,500 additional scientists and engineers into the higher education sector, for a total of about 348,800 (chart 2). Full-time S/E personnel represented slightly more than three-quarters of the total and rose by 3 percent from 1981 to 1982. Part-time S/E personnel grew by 9 percent during the 1981/82 school year and accounted for nearly one-half the total S/E increase in academia.

Growth in S/E employment differed according to type of institution with rates of increase for part-timers exceeding those for full-timers in almost all categories. Numbers of full-time scientists and engineers employed in doctorate- and bachelor's-granting institutions grew by about 2 percent to 3 percent between 1981 and 1982, with part-time employment increasing at 8 percent and 12 percent, respectively. The fastest growth rates continued in 2-year institutions where 1982 full-time S/E employment rose 6 percent. Part-timers, comprising about two-fifths of all scientists and engineers in 2-year colleges, increased 17 percent in 1982 and accounted for a large proportion—44 percent—of the total gain in part-time personnel across all types of institutions. Doctorate-granting institutions were responsible for most of the remaining expansion in part-timers.

While employment rose in all S/E disciplines, the largest rates of increase were concentrated in the mathematical/computer sciences, life sciences, and engineering (chart 3). Mathematical/computer scientists were up 8 percent overall from 1981 to 1982, with computer scientists growing at a much faster pace (18 percent) than mathematicians (5 percent). The number of computer scientists employed part time jumped 28 percent from 1981 to 1982 and has averaged an 18-percent per year increase since 1975. These sharp increases can be traced in part to large enrollment gains at all levels in the computer sciences. For example, graduate enrollment was up 20 percent between fall 1980 and fall 1981 and has risen at an average annual rate of 11 percent since 1975.[5]

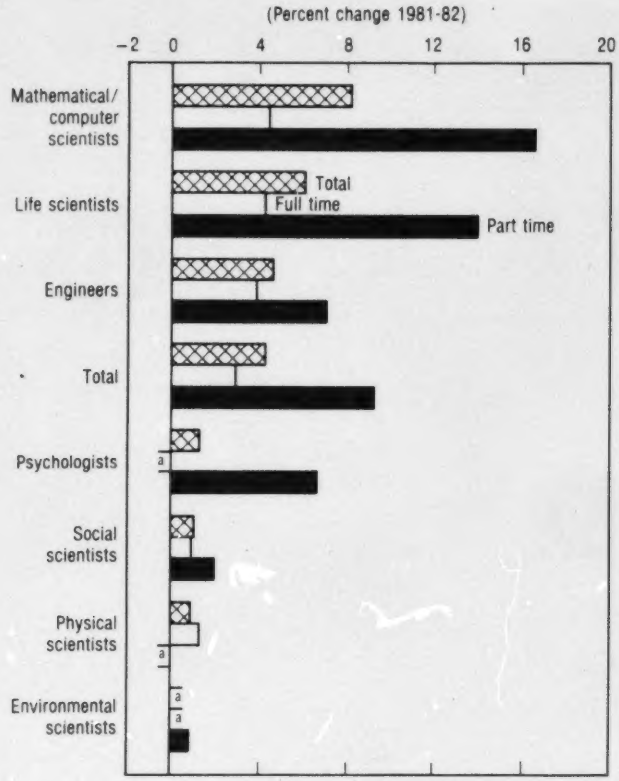
Academic Versus National S/E Employment Trends

S/E employment in the academic sector has grown at a somewhat slower rate than that for other sectors. Employment of scientists and engineers at universities and colleges grew at an average annual rate of 3 percent during the 1975-82 period, while employment in both the industrial sector and the Federal Government grew 5 percent per year. The 1981/82 increase of 4 percent in academic S/E employment compared to 8 percent for industry and 7 percent for the Federal Government.[6] The slower rate of increase in the academic

[5] National Science Foundation, *Academic Science/Engineering: Graduate Enrollment and Support, Fall 1981* (Detailed Statistical Tables) (NSF 83-305) (Washington, D.C., 1982), table B-1.

[6] National Science Foundation, *National Patterns of Science and Technology Resources, 1983, op. cit.* In comparing these sectoral differences in growth rates, the reader is cautioned that the data on Federal Government and industry employment were drawn from sources that use different surveys and different methods. The finding of a slower growth rate in academic employment, however, remains after these differences are controlled for.

Chart 3. Scientists and engineers employed at universities and colleges by field and status



[a]Less than 0.5 percent
SOURCE: National Science Foundation

sector can be attributed in part to current and projected future declines in the rate of enrollment growth as well as to institutional budgetary constraints.

There were also significant differences in rates of employment of scientists versus engineers when compared by sector. Within the higher education community, rates of growth for scientists and engineers were similar between 1975 and 1982, with scientists increasing 3 percent per year and engineers about 4 percent per year. The 1981/82 gain was up 1 percentage point for both groups. At the national level, employment of scientists has consistently grown since 1975 at a slightly faster pace than that of engineers. The most recent annual data show accelerated rates for scientists whose employment "... increased substantially faster than employment of engineers ...."[7] This slower rate of growth for engineers was attributed to shortages in some fields while almost one-half of the increase for scientists was accounted for by computer specialists.

Women in Academic Science/Engineering

The total number of women S/E professionals employed in academic institutions grew at a rate of 9 percent from 1981 to 1982, while their male counterparts increased 3 percent. S/E personnel employed part time, up by 9 percent for both women and men, accounted for nearly one-half of the 1981/82 increase in scientists and engineers. The absolute gain in full-time employment was similar for both sexes, although the 8-percent growth rate of women employed full time was four times greater than that for men.

In almost all major S/E fields, the proportion of women employed full time in higher education has gained consistently since the midseventies, when data were first available by sex. Their proportion increased from 15 percent of all full-time scientists and engineers in 1975 to 19 percent in 1982. The highest average annual rates of growth during this period occurred in engineering and the environmental sciences—13 percent and 14 percent—while the fastest 1981/82 rates occurred in life (11 percent) and mathematical/computer sciences (9 percent). For men, in contrast, there were no fields where the average yearly change was more than 3 percent.

Recent data indicate that women constitute about 45 percent of all professional and technical workers in the United States.[8] Women employed in the national S/E work force, however, comprise only slightly more than 13 percent of the total, while they account for 20 percent of the academic S/E work force. Across all sectors, women represent 23 percent of total scientists and 2 percent of all engineers, about the same as their representation in academic institutions. Even though women account for a smaller share in the national S/E labor force than in the academic sector, their employment gains in absolute numbers and their rates of growth have been faster in all other sectors when compared to the gains of women in academia.[9]

In the academic sector, both women and men were concentrated most heavily in the life sciences. In all economic sectors combined, women were concentrated particularly in mathematical/computer sciences (33 percent) and life sciences (22 percent) (chart 4). Men were most often employed in engineering (53 percent).[10] In the industrial sector, where demand for computer scientists is particularly high, nearly one-half of all women scientists and engineers were employed in 1981 as computer specialists compared to 14 percent of all men. In the academic sector, comparable proportions for women and men computer scientists were only 3 percent and 4 percent, respectively.

Research Activity

The full-time equivalent of academic scientists and engineers employed in separately budgeted R&D activities rose in 1982 to about 60,000. This represented 8 percent of the national total of full-time equivalents in research and development. The average FTE R&D annual growth rate between 1975 and 1982 in academic institutions was only 2 percent compared to a 5-percent per year increase in the industrial sector. Industry has steadily increased its share of the national

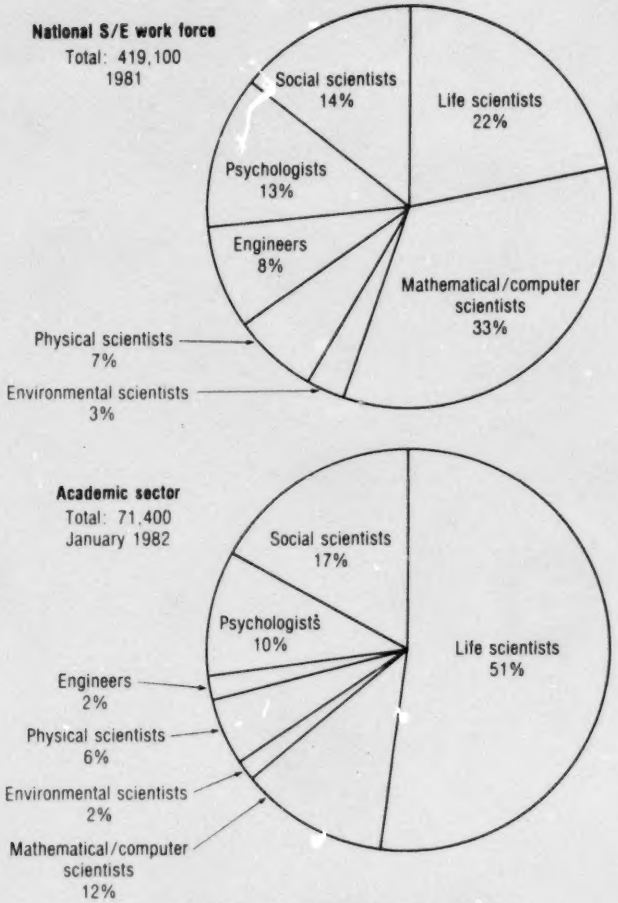
[7] National Science Foundation, "Growth in Science and Engineering Employment Accelerated in 1980 to 1981—But Demand May Have Slackened in 1982," *Science Resources Studies Highlights*, (NSF 83-300) (Washington, D.C., February 11, 1983), p. 1.

[8] Department of Labor, Bureau of Labor Statistics, *Employment and Earnings* (Washington, D.C.: Supt. of Documents, U.S. Government Printing Office, January 1982).

[9] National Science Foundation, *National Patterns of Science and Technology Resources, 1983*, *op. cit.*

[10] National Science Foundation, *Science Resources Studies Highlights*, "Growth in Science and Engineering Enrollment Accelerated in 1980 to 1981—But Demand May Have Slackened in 1982", *op. cit.*, p. 4.

Chart 4. Women scientists and engineers employed in the national S/E work force and in the academic sector



SOURCE: National Science Foundation

total during this period—representing close to 75 percent in 1982—while academia's portion has declined slightly.

The 15 Leading Institutions

At the 15 institutions employing the largest numbers of scientists and engineers, the number of S/E professionals rose approximately 3 percent from 1981 to 1982, slightly less than the increase shown across all institutions combined (table 1). These doctorate-granting institutions employed about 13 percent of the total academic S/E work force and 24 percent of total full-time equivalents engaged in research and development.

Table 1. The 15 institutions employing the greatest number of scientists and engineers: January 1982

Institution	*S/E employment*	*Percent change 1981-82*
Total, all institutions	348,800	4%
Total, leading 15 institutions	46,800	3
1. Harvard University	5,992	3
2. Ohio State University	4,232	13
3. University of Wisconsin-Madison	3,729	- 2
4. University of Minnesota	3,534	- 3
5. Johns Hopkins University	3,488	5
6. Louisiana State University	3,072	1
7. University of Michigan	3,064	- 8
8. University of California-Los Angeles	2,899	16
9. University of Illinois-Urbana	2,563	(1)
10. University of Washington	2,520	(1)
11. Cornell University	2,415	- 3
12. University of Florida	2,376	5
13. University of California-Berkeley	2,315	11
14. Yale University	2,305	10
15. Pennsylvania State University	2,283	3
Total, all other institutions	302,000	5

(1) Less than 0.5 percent change.

SOURCE: National Science Foundation

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The report, *Academic Science/Engineering: Scientists and Engineers, January 1982* (Detailed Statistical Tables) (NSF 83-311), can be obtained from the Division of Science Resources Studies, National Science Foundation, Washington, D.C. 20550. For information on availability of data tapes, please call (202) 634-4673.

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